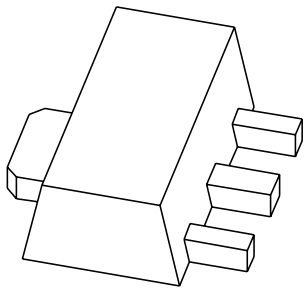
DATA SHEET



PBSS4480X

80 V, 4 A
NPN low V_{CEsat} (BISS) transistor

Product specification
Supersedes data of 2004 Aug 5

2004 Oct 25

Philips
Semiconductors

PHILIPS

80 V, 4 A NPN low V_{CEsat} (BISS) transistor

PBSS4480X

FEATURES

- High h_{FE} and low V_{CEsat} at high current operation
- High collector current capability: I_C maximum 4 A
- High efficiency leading to less heat generation.

APPLICATIONS

- Medium power peripheral drivers; e.g. fan, motor
- Strobe flash units for DSC and mobile phones
- Inverter applications; e.g. TFT displays
- Power switch for LAN and ADSL systems
- Medium power DC-to-DC conversion
- Battery chargers.

DESCRIPTION

NPN low V_{CEsat} transistor in a SOT89 (SC-62) plastic package.
PNP complement: PBSS5480X.

MARKING

TYPE NUMBER	MARKING CODE(1)
PBSS4480X	*1Y

Note

1. * = p: made in Hong Kong.
   * = t: made in Malaysia.
   * = W: made in China.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	UNIT
V_{CEO}	collector-emitter voltage	80	V
I_C	collector current (DC)	4	A
I_{CM}	peak collector current	10	A
R_{CEsat}	equivalent on-resistance	54	mΩ

PINNING

PIN	DESCRIPTION
1	emitter
2	collector
3	base

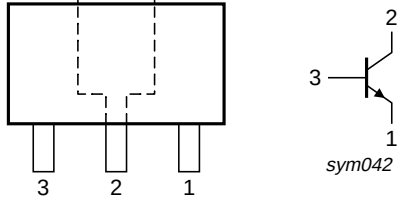


Fig.1 Simplified outline (SOT89) and symbol.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PBSS4480X	–	plastic surface mounted package; collector pad for good heat transfer; 3 leads	SOT89

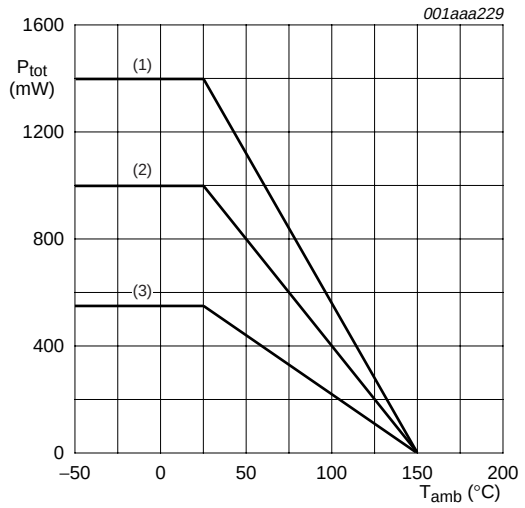
LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	80	V
V_{CEO}	collector-emitter voltage	open base	–	80	V
V_{EBO}	emitter-base voltage	open collector	–	5	V
I_C	collector current (DC)	note 4	–	4	A
I_{CRM}	repetitive peak collector current	$t_p \leq 10$ ms; $\delta \leq 0.1$	–	6	A
I_{CM}	peak collector current	t = 1 ms or limited by $T_{j(max)}$	–	10	A
I_B	base current (DC)		–	1	A
I_{BM}	peak base current	$t \leq 300$ µs	–	2	A
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C			
		notes 1 and 2	–	2.5	W
		note 2	–	550	mW
		note 3	–	1	W
		note 4	–	1.4	W
		note 5	–	1.6	W
T_j	junction temperature		–	150	°C
T_{amb}	ambient temperature		–65	+150	°C
T_{stg}	storage temperature		–65	+150	°C

Notes

1. Operated under pulsed conditions; pulse width $t_p \leq 10$ ms; duty cycle $\delta \leq 0.2$.
2. Device mounted on a printed-circuit board, single-sided copper, tin-plated and standard footprint.
3. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 1 cm^2.
4. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 6 cm^2.
5. Device mounted on a 7 cm^2 ceramic printed-circuit board, 1 cm^2 single-sided copper and tin-plated. For other mounting conditions, see *“Thermal considerations for SOT89 in the General Part of associated Handbook”*.



(1) FR4 PCB; 6 cm^2 mounting pad for collector.
(2) FR4 PCB; 1 cm^2 mounting pad for collector.
(3) FR4; standard footprint.

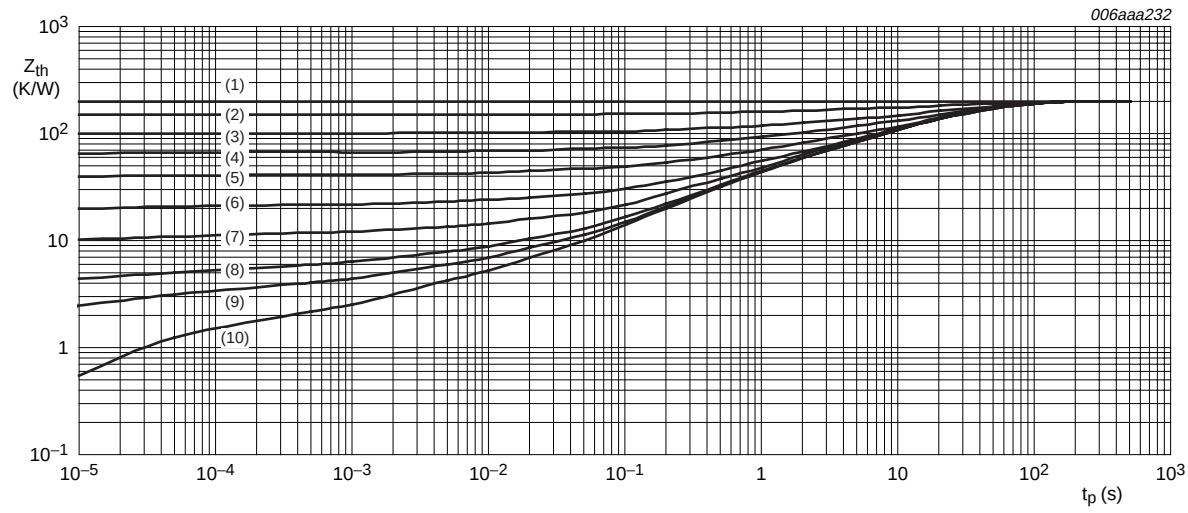
Fig.2 Power derating curves.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		
		notes 1 and 2	50	K/W
		note 2	225	K/W
		note 3	125	K/W
		note 4	90	K/W
		note 5	80	K/W
$R_{th(j-s)}$	thermal resistance from junction to soldering point		16	K/W

Notes

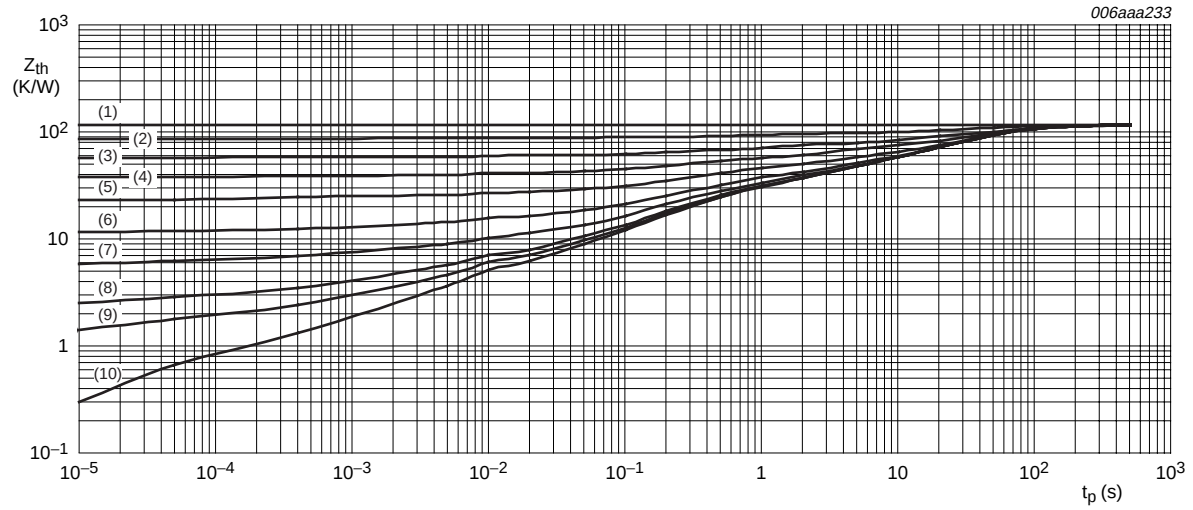
1. Operated under pulsed conditions; pulse width $t_p \leq 10$ ms; duty cycle $\delta \leq 0.2$.
2. Device mounted on a printed-circuit board, single-sided copper, tin-plated and standard footprint.
3. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 1 cm^2.
4. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 6 cm^2.
5. Device mounted on a 7 cm^2 ceramic printed-circuit board, 1 cm^2 single-sided copper and tin-plated. For other mounting conditions, see *"Thermal considerations for SOT89 in the General Part of associated Handbook"*.



Mounted on FR4 printed-circuit board; standard footprint.

(1) $\delta = 1$. (3) $\delta = 0.5$. (5) $\delta = 0.2$. (7) $\delta = 0.05$. (9) $\delta = 0.01$.
(2) $\delta = 0.75$. (4) $\delta = 0.33$. (6) $\delta = 0.1$. (8) $\delta = 0.02$. (10) $\delta = 0$.

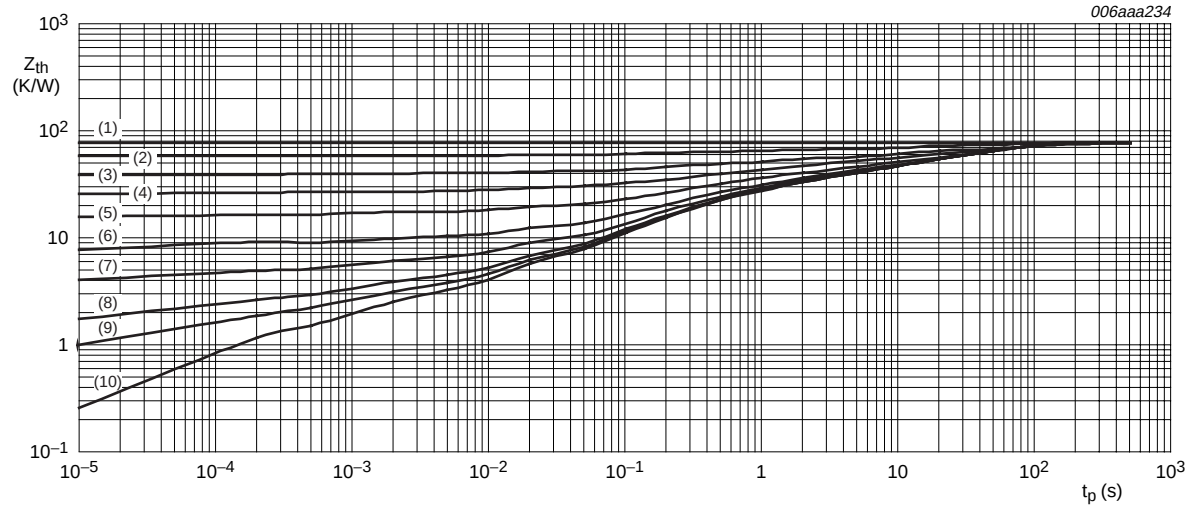
Fig.3 Transient thermal impedance as a function of pulse time; typical values.



Mounted on FR4 printed-circuit board; mounting pad for collector 1 cm^2.

(1) δ = 1. (3) δ = 0.5. (5) δ = 0.2. (7) δ = 0.05. (9) δ = 0.01.
(2) δ = 0.75. (4) δ = 0.33. (6) δ = 0.1. (8) δ = 0.02. (10) δ = 0.

Fig.4 Transient thermal impedance as a function of pulse time; typical values.



Mounted on FR4 printed-circuit board; mounting pad for collector 6 cm^2.

(1) δ = 1. (3) δ = 0.5. (5) δ = 0.2. (7) δ = 0.05. (9) δ = 0.01.
(2) δ = 0.75. (4) δ = 0.33. (6) δ = 0.1. (8) δ = 0.02. (10) δ = 0.

Fig.5 Transient thermal impedance as a function of pulse time; typical values.

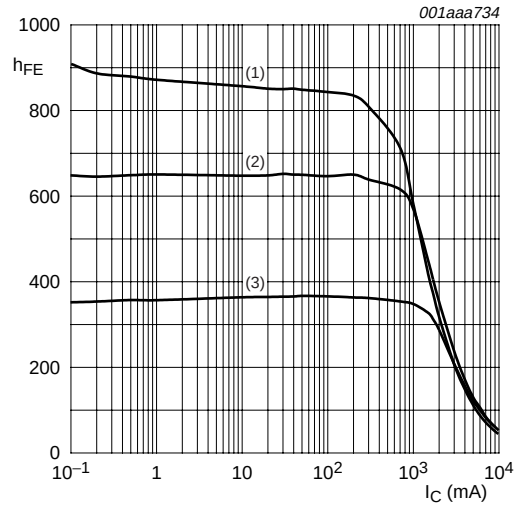
CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector-base cut-off current	V_{CB} = 80 V; I_E = 0 A	–	–	100	nA
		V_{CB} = 80 V; I_E = 0 A; T_j = 150 °C	–	–	50	µA
I_{CES}	collector-emitter cut-off current	V_{CE} = 80 V; V_{BE} = 0 V	–	–	100	nA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A	–	–	100	nA
h_{FE}	DC current gain	V_{CE} = 2 V; I_C = 0.5 A	250	400	–	–
		V_{CE} = 2 V; I_C = 1 A; note 1	250	400	–	–
		V_{CE} = 2 V; I_C = 2 A; note 1	175	270	–	–
		V_{CE} = 2 V; I_C = 4 A; note 1	80	140	–	–
V_{CEsat}	collector-emitter saturation voltage	I_C = 0.5 A; I_B = 50 mA	–	25	40	mV
		I_C = 1 A; I_B = 50 mA	–	55	80	mV
		I_C = 2 A; I_B = 40 mA	–	110	160	mV
		I_C = 4 A; I_B = 200 mA; note 1	–	170	230	mV
		I_C = 5 A; I_B = 500 mA; note 1	–	200	270	mV
R_{CEsat}	equivalent on-resistance	I_C = 5 A; I_B = 500 mA; note 1	–	40	54	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = 0.5 A; I_B = 50 mA	–	0.78	0.85	V
		I_C = 1 A; I_B = 50 mA	–	0.79	0.9	V
		I_C = 1 A; I_B = 100 mA; note 1	–	0.82	0.95	V
		I_C = 4 A; I_B = 400 mA; note 1	–	0.95	1.05	V
V_{BEon}	base-emitter turn-on voltage	I_C = 2 A; V_{CE} = 2 V	–	0.78	0.85	V
f_T	transition frequency	I_C = 100 mA; V_{CE} = 10 V; f = 100 MHz	120	150	–	MHz
C_c	collector capacitance	$I_E = i_e$ = 0 A; V_{CB} = 10 V; f = 1 MHz	–	35	50	pF

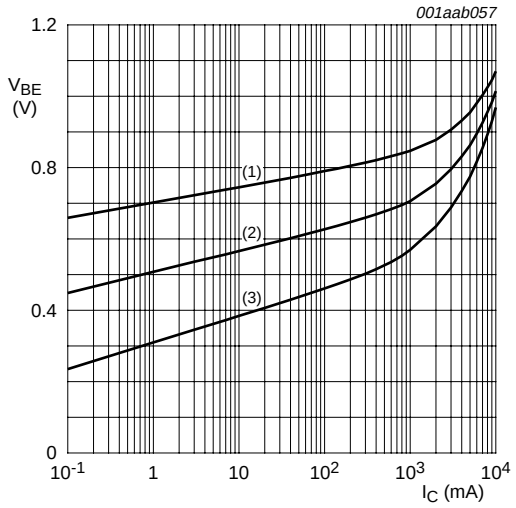
Note

1. Pulse test: $t_p \leq 300$ µs; $\delta \leq 0.02$.



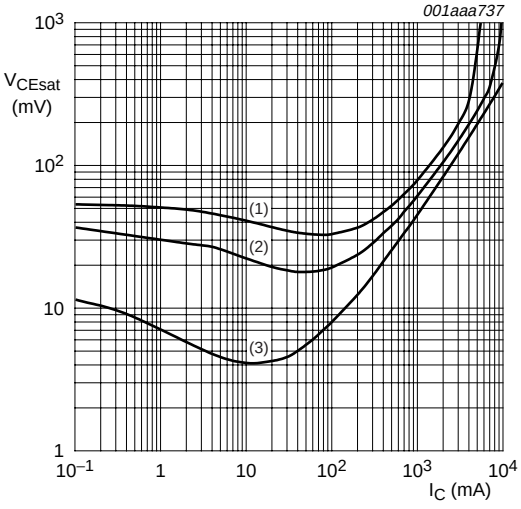
V_{CE} = 2 V.
(1) T_{amb} = 100 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = –55 °C.

Fig.6 DC current gain as a function of collector current; typical values.



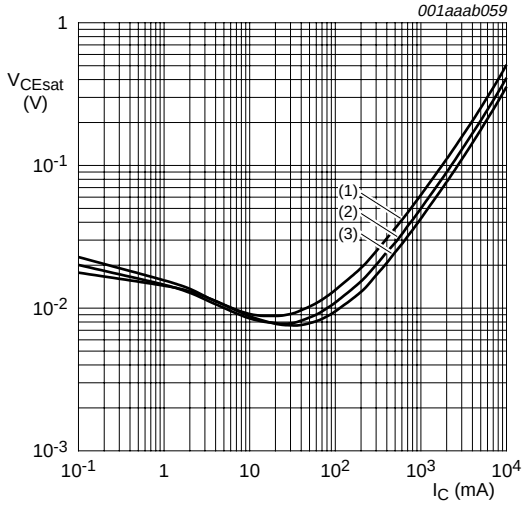
V_{CE} = 2 V.
(1) T_{amb} = –55 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = 100 °C.

Fig.7 Base-emitter voltage as a function of collector current; typical values.



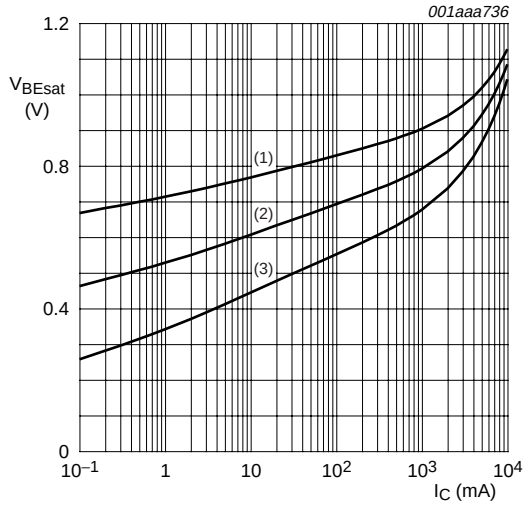
(1) I_C/I_B = 100.
(2) I_C/I_B = 50.
(3) I_C/I_B = 10.

Fig.8 Collector-emitter saturation voltage as a function of collector current; typical values.



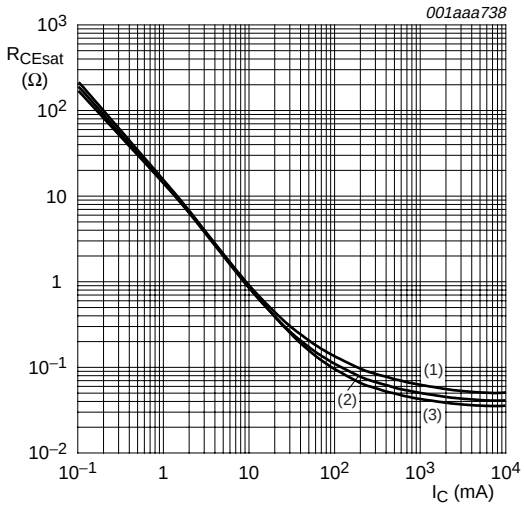
I_C/I_B = 20.
(1) T_{amb} = 100 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = –55 °C.

Fig.9 Collector-emitter saturation voltage as a function of collector current; typical values.



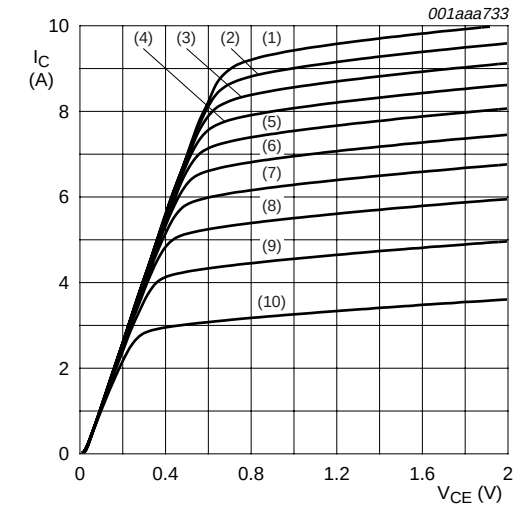
I_C/I_B = 20.
(1) T_{amb} = –55 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = 100 °C.

Fig.10 Base-emitter saturation voltage as a function of collector current; typical values.



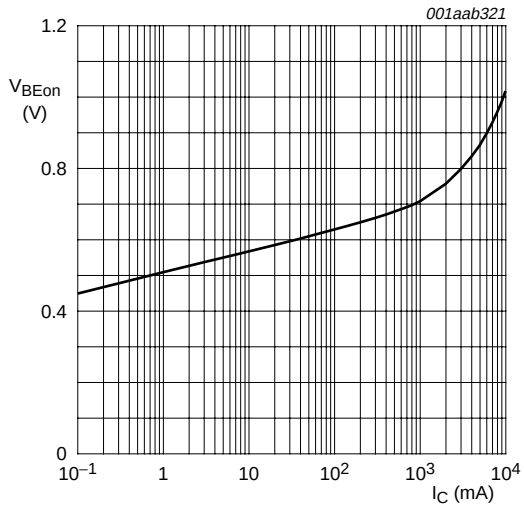
I_C/I_B = 20.
(1) T_{amb} = 100 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = –55 °C.

Fig.11 Equivalent on-resistance as a function of collector current; typical values.



(1) I_B = 190 mA.
(2) I_B = 171 mA.
(3) I_B = 152 mA.
(4) I_B = 133 mA.
(5) I_B = 114 mA.
(6) I_B = 95 mA.
(7) I_B = 76 mA.
(8) I_B = 57 mA.
(9) I_B = 38 mA.
(10) I_B = 19 mA.

Fig.12 Collector current as a function of collector-emitter voltage; typical values.



T_{amb} = 25 °C.

Fig.13 Base-emitter turn-on voltage as a function of collector current; typical values.

Reference mounting conditions

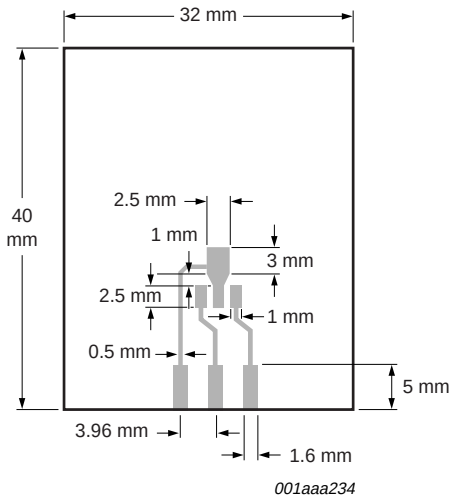


Fig.14 FR4, standard footprint.

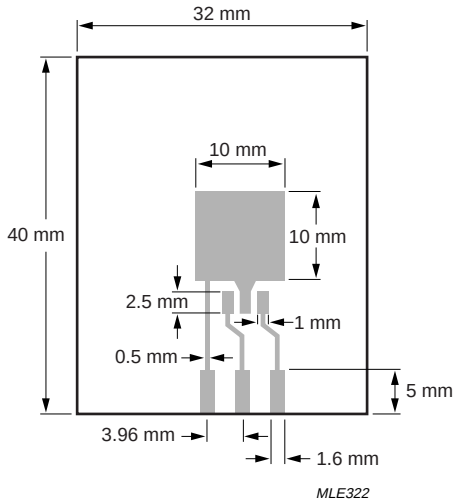


Fig.15 FR4, mounting pad for collector 1 cm^2.

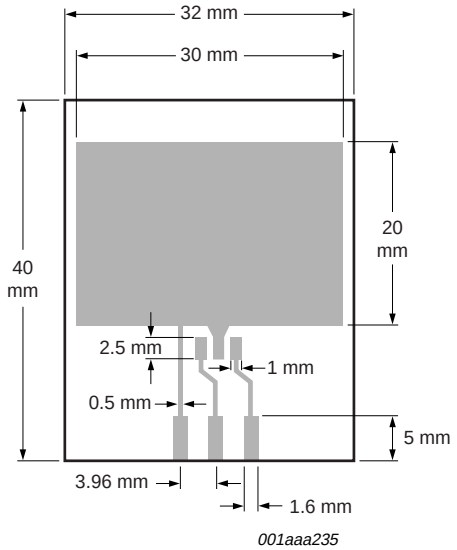
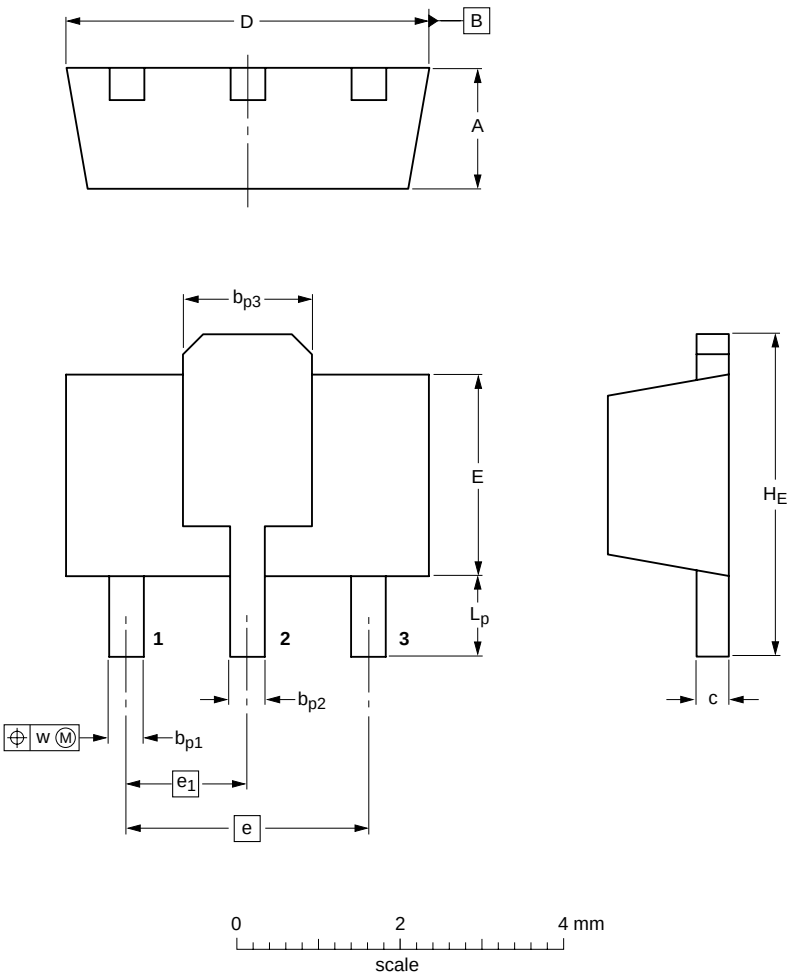


Fig.16 FR4, mounting pad for collector 6 cm^2.

PACKAGE OUTLINE

Plastic surface mounted package; collector pad for good heat transfer; 3 leads **SOT89**



DIMENSIONS (mm are the original dimensions)

UNIT	A	b_{p1}	b_{p2}	b_{p3}	c	D	E	e	e_1	H_E	L_p	w
mm	1.6 1.4	0.48 0.35	0.53 0.40	1.8 1.4	0.44 0.23	4.6 4.4	2.6 2.4	3.0	1.5	4.25 3.75	1.2 0.8	0.13

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT89		TO-243	SC-62			~~99-09-13~~ 04-08-03

DATA SHEET STATUS

LEVEL	DATA SHEET STATUS(1)	PRODUCT STATUS(2)(3)	DEFINITION
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
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2. The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.
3. For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

DEFINITIONS

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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